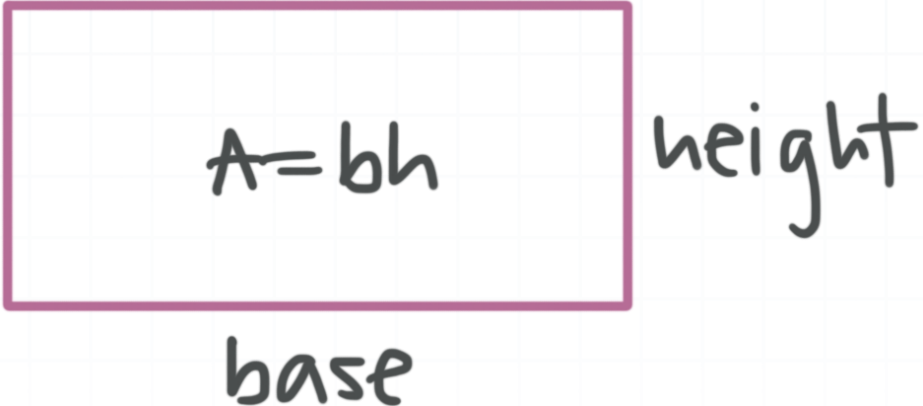


Area of a rectangle using sums and differences

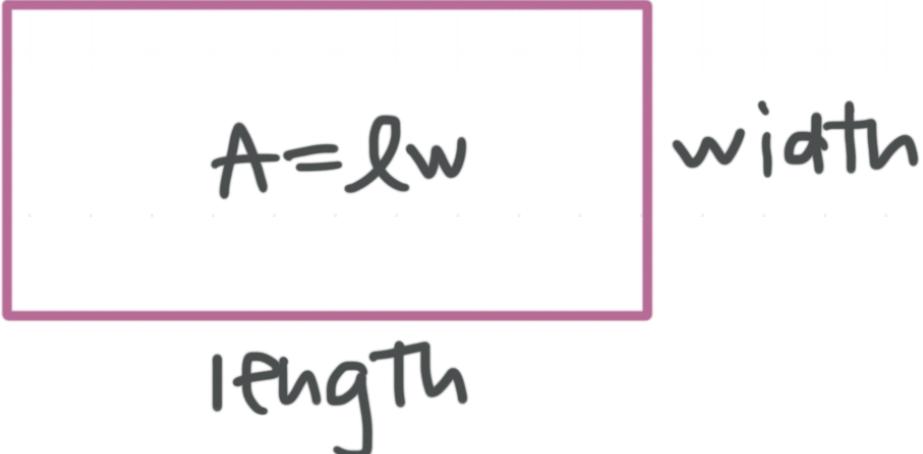
In this lesson we'll look at composite figures made from rectangles and how to find their areas.

Remember first that the area of a rectangle is its base times its height, or its length times its width, and that the area of a rectangle is always given in square units, like in^2 or cm^2 .


$$A = bh$$

height

base


$$A = lw$$

width

length

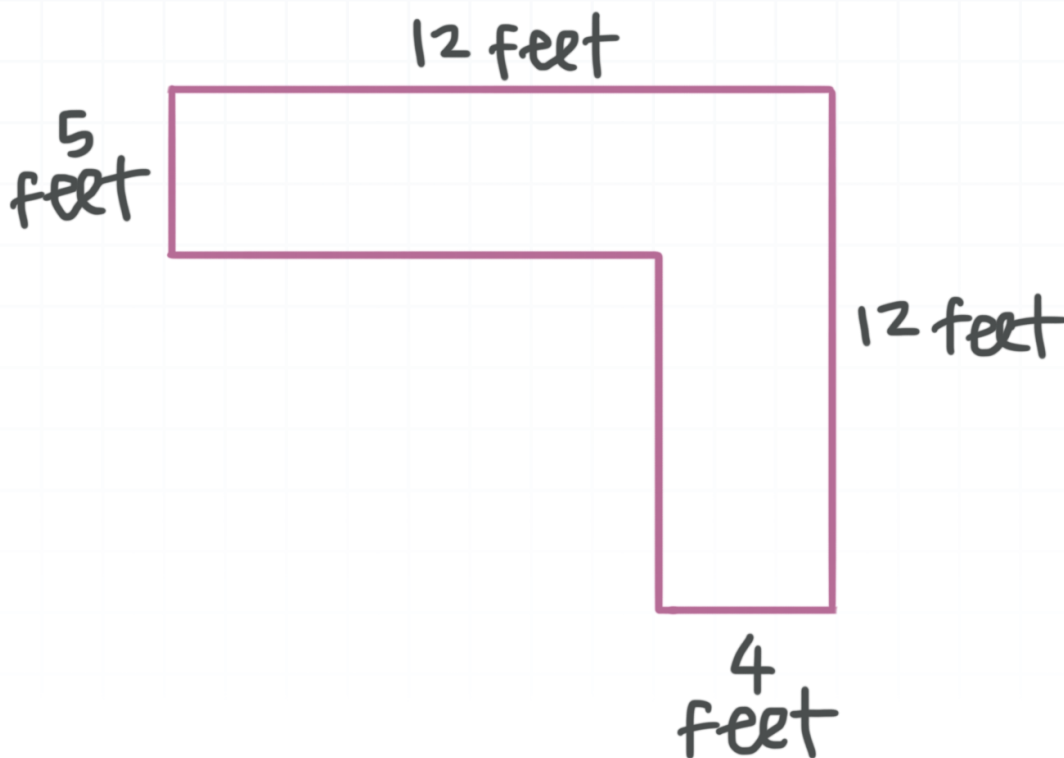
Composite figures

A composite figure is made by combining different shapes. You can divide a composite figure into shapes you know to find its area.



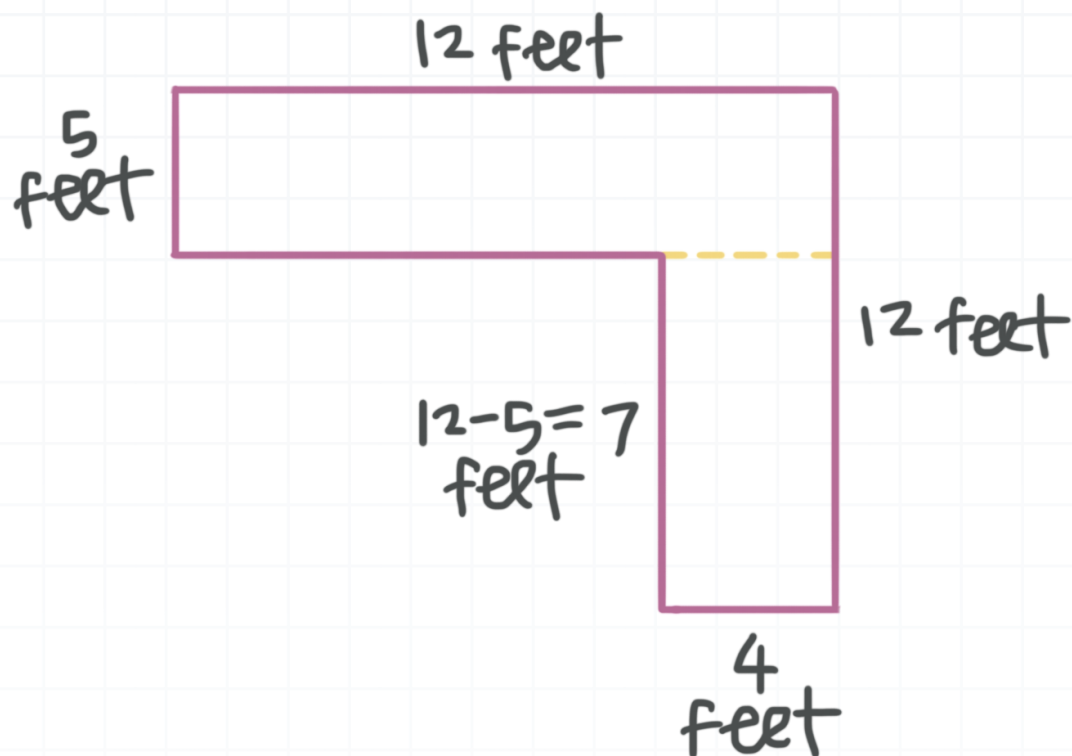
Area using a sum

Below is a composite figure made of rectangles. You can divide the shape into two rectangles and use the area formula for a rectangle twice to find the area of the figure.



A shape can be divided in more than one way, but no matter how you divide the shape, the value of the area will always be the same. We can separate the figure with a horizontal line.





The height of the entire figure is 12 and the height of the upper rectangle is 5, so we can find the height of the lower rectangle by subtracting $12 - 5 = 7$. Now we know the dimensions for both of the smaller rectangles.

The dimensions of the upper rectangle are 5 by 12, so its area is

$$A = bh$$

$$A = 5 \cdot 12$$

$$A = 60 \text{ ft}^2$$

The dimensions of the lower rectangle are 4 by 7, so its area is

$$A = bh$$

$$A = 4 \cdot 7$$

$$A = 28 \text{ ft}^2$$

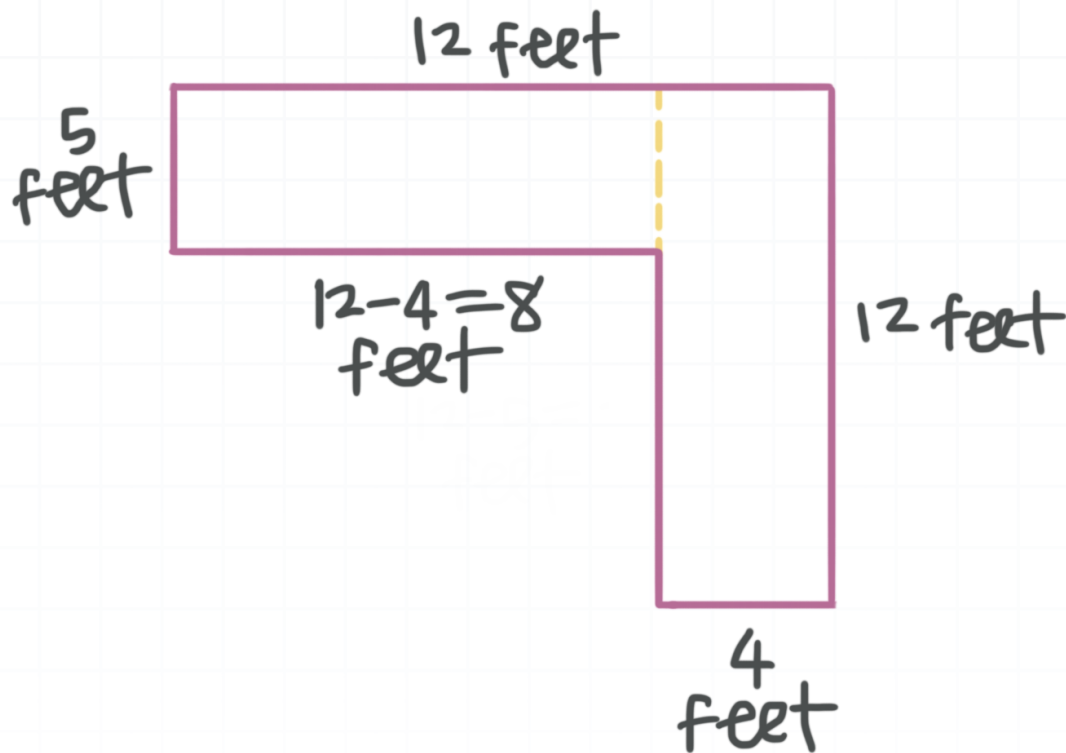
So the area of the total figure is



$$A = 60 + 28$$

$$A = 88 \text{ ft}^2$$

We could also separate the figure with a vertical line.



The length of the entire figure is 12, and the length of the right rectangle is 4, so we can find the length of the left rectangle by subtracting $12 - 4 = 8$. Now we know the dimensions for both rectangles.

The dimensions of the left rectangle are 8 by 5, so its area is

$$A = lw$$

$$A = 8 \cdot 5$$

$$A = 40 \text{ ft}^2$$

The dimensions of the right rectangle are 4 by 12, so its area is

$$A = lw$$



$$A = 4 \cdot 12$$

$$A = 48 \text{ ft}^2$$

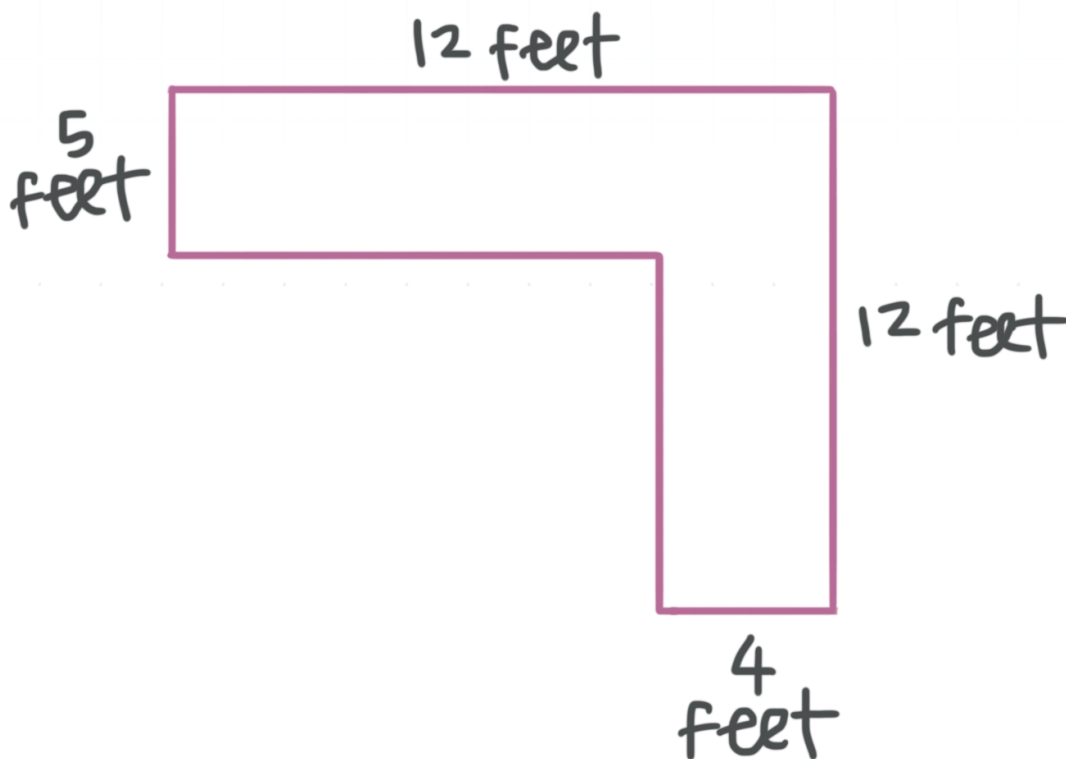
So the total area is

$$A = 40 + 48$$

$$A = 88 \text{ ft}^2$$

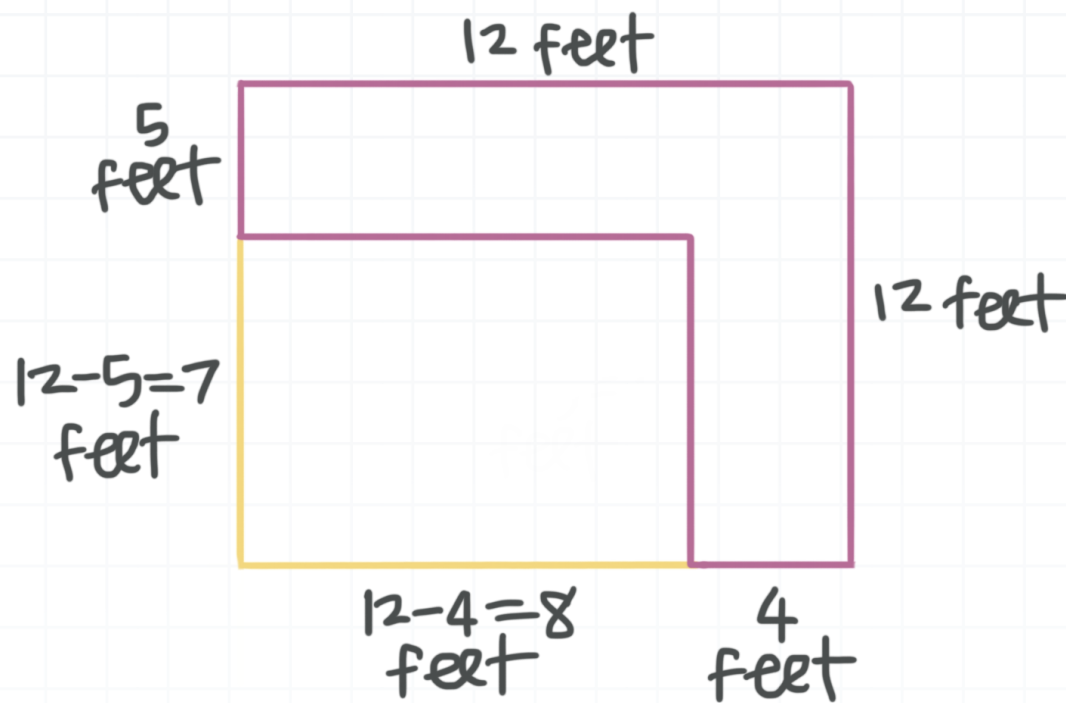
Area using a difference

You can also use a difference to find the area of a composite figure. Let's look at this one again.



We can draw a rectangle in the empty space.





The base of the whole figure is 12, so the base of the empty space must be $12 - 4 = 8$. The height of the whole figure is 12, so the height of the empty space must be $12 - 5 = 7$.

The area of the whole rectangle (really it's a square since the base and height are the same) is equal to $12 \cdot 12 = 144 \text{ ft}^2$. The area of the missing space is $7 \cdot 8 = 56 \text{ ft}^2$. So we can subtract to find the area of the composite figure.

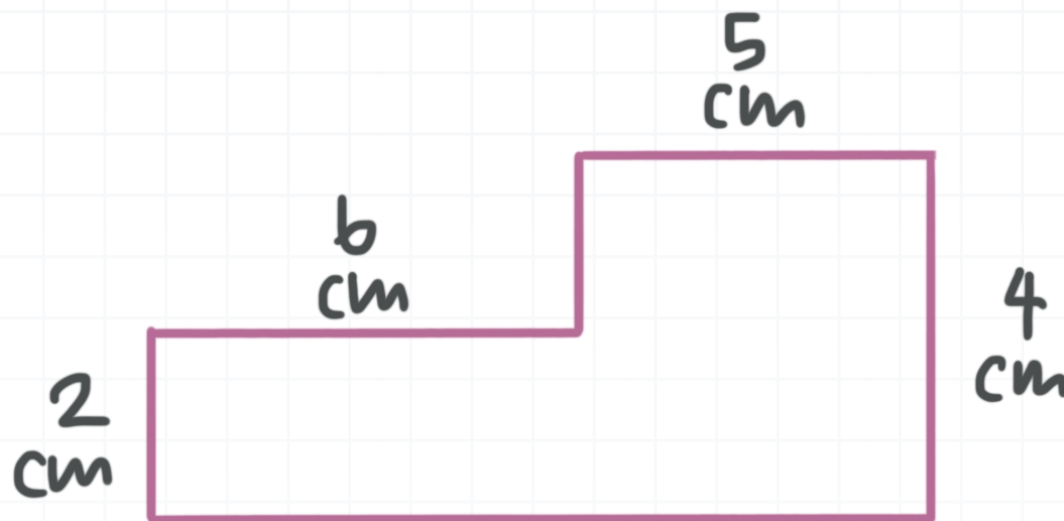
$$144 - 56 = 88 \text{ ft}^2$$

Which is the same area we got when we used sums, instead of differences. Let's do some more examples.

Example

The figure is made by combining rectangles. What is the area of the figure?





The height of the lower rectangle is 2, so we can find the height of the upper rectangle by subtracting $4 - 2 = 2$ cm. The dimensions of the upper rectangle are 5 by 2, so its area is

$$A = bh$$

$$A = 5 \cdot 2$$

$$A = 10 \text{ cm}^2$$

We need to add to find the base of the lower rectangle. Its base is made of the horizontal 6 cm and the horizontal 5 cm. So the base of the lower rectangle is $6 + 5 = 11$ cm. The dimensions of the lower rectangle are therefore 2 by 11, so its area is

$$A = bh$$

$$A = 2 \cdot 11$$

$$A = 22 \text{ cm}^2$$

So the total area of the figure is

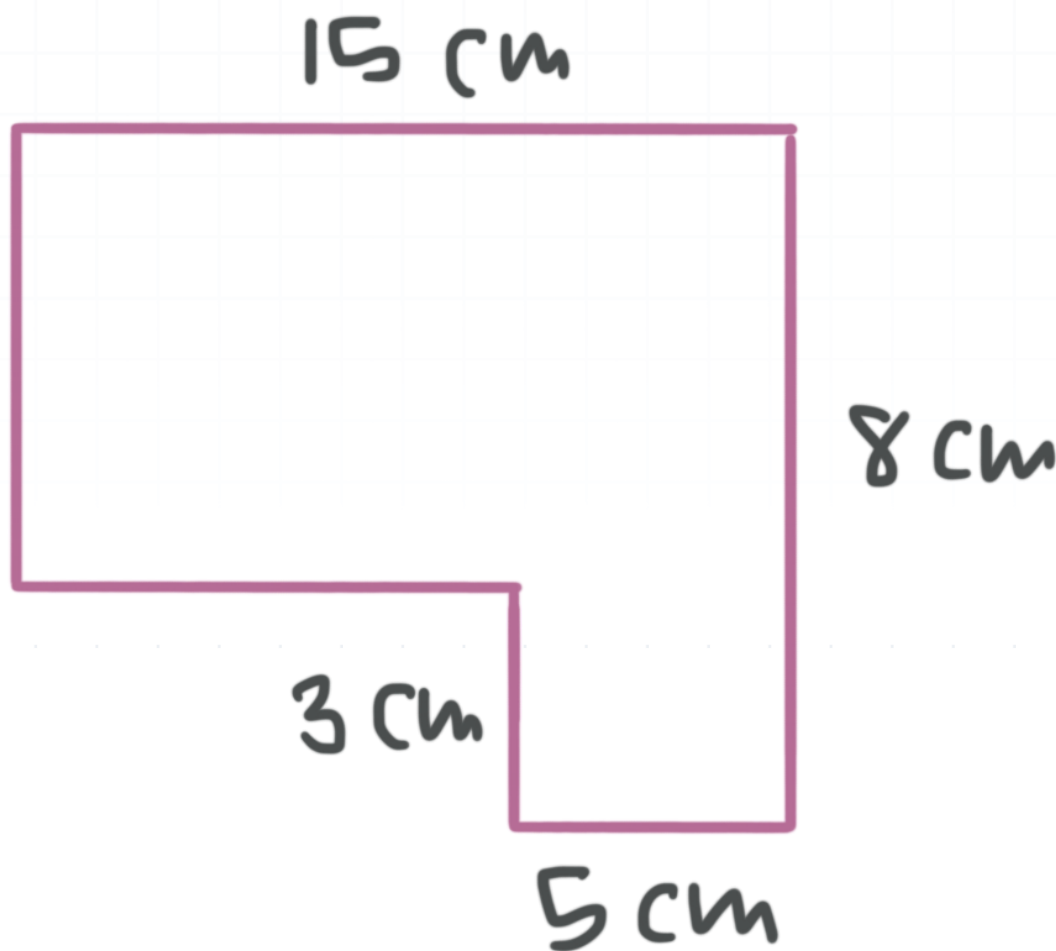


$$A = 10 + 22 = 32 \text{ cm}^2$$

Let's do one more examples.

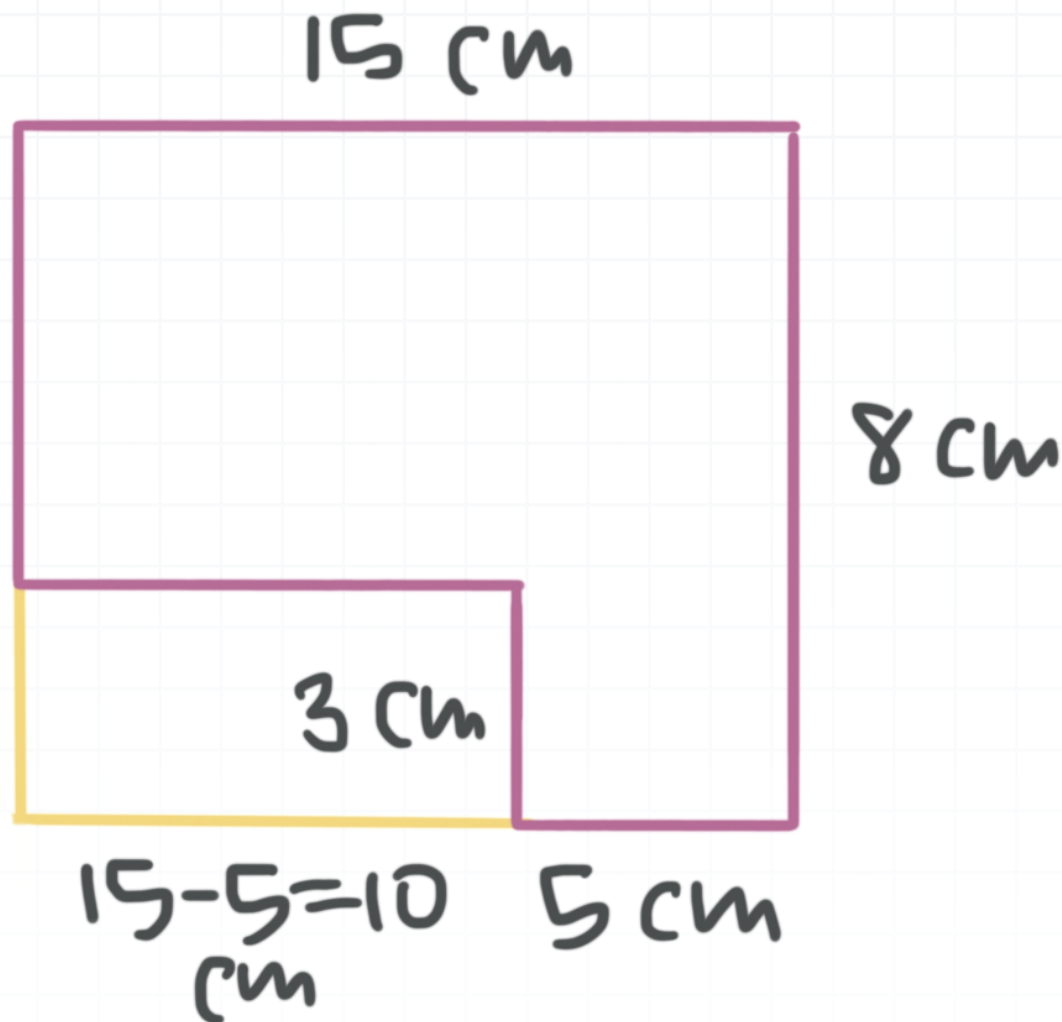
Example

The figure is made by combining rectangles. What is the area of the figure?



Here's one way to solve the problem: Draw the rectangle that fits in the empty space.





The height of the whole figure is 8, and the base of the whole figure is 15. The dimensions of the whole figure are 15 by 8, so its area is

$$A = bh$$

$$A = 15 \cdot 8$$

$$A = 120 \text{ cm}^2$$

The empty space has a height of 3, and we can find the base by subtracting $15 - 5 = 10$ cm. The dimensions of the empty space are therefore 10 by 3, so its area is

$$A = bh$$

$$A = 10 \cdot 3$$



$$A = 30 \text{ cm}^2$$

We can then say that the area of the original figure is

$$A = bh$$

$$A = 120 - 30$$

$$A = 90 \text{ cm}^2$$

